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;      A L T O C O N S T S 2 3 . M U
; Copyright Xerox Corporation 1979

; Symbol and constant definitions for the standard Alto microcode.
; These definitions are for:
;   AltoCode23, AltoCode24, AltoIICode2, and AltoIICode3
; By convention, people writing microcode should 'include' this file
;   in front of their microcode using the following MU construct:
;   #AltoConsts23.mu;
; This entire file is full of magic. If you modify it in any way
;   you run the risk of being incompatible with the Alto world,
;   not to mention having your Alto stop working.
;
; Revision History:
; September 20, 1977  8:33 PM by Boggs
;   Created from old AltoConsts23.mu
; September 23, 1977 12:17 PM by Taft
; October 11, 1977  2:07 PM by Boggs
;   Added XMAR definition
; May 21, 1979  6:42 PM by Taft
;   Added SRB← and ESRB←
```

## ;Symbol definitions

## ;Bus Sources

;BS 0 ← RRegister

;BS 1 RRegister← (zeroes the bus)

;BS 2 is undefined and therefore makes the bus all ones

;BS 3 and 4 are task specific. For the 'Ram related' tasks they are:

; BS 3: ← SRegister

; BS 4: SRegister← (clobbers the bus with undefined value)

;BS 5 is main memory data (see definition for MD, below)

\$MOUSE \$L000000,014006,000100; BS = 6

;DISP \$L000000,014007,000120; BS = 7

## ;Standard F1s

\$XMAR \$L072000,000000,144000; F1 = 1 and F2 = 6 (Extended MAR)

\$MAR \$L020001,000000,144000; F1 = 1

\$TASK \$L016002,000000,000000; F1 = 2

\$BLOCK \$L016003,000000,000000; F1 = 3

\$LLSH1 \$L000000,022004,000200; F1 = 4

\$LRSH1 \$L000000,022005,000200; F1 = 5

\$LLCY8 \$L000000,022006,000200; F1 = 6

## ;Standard F2s

\$BUS=0 \$L024001,000000,000000; F2 = 1

;SSH&lt;0 \$L024002,000000,000000; F2 = 2

;SSH=0 \$L024003,000000,000000; F2 = 3

\$BUS \$L024004,000000,000000; F2 = 4

\$ALUCY \$L024005,000000,000000; F2 = 5

\$MD \$L026006,014005,124100; F2 = 6, BS = 5

## ;Emulator specific functions

\$BUSODD \$L024010,000000,000000; F2 = 10

\$LMRSH1 \$L000000,062005,000200; F2 = 11 Magic Right Shift

\$LMLSH1 \$L000000,062004,000200; F2 = 11 Magic Left Shift

\$DNS \$L030012,000000,060000; F2 = 12 Do Nova Shift

\$ACDEST \$L030013,032013,060100; F2 = 13 Nova Destination AC

\$IR \$L026014,000000,124000; F2 = 14 Instruction Register

;IDISP \$L024015,000000,000000; F2 = 15 IR Dispatch

\$ACSOURCE \$L000000,032016,000100; F2 = 16 Nova Source AC

## ;RAM-related task-specific functions

\$SWMODE \$L016010,000000,000000; F1 = 10 Switch Mode (emulator only)

;WRTRAM \$L016011,000000,000000; F1 = 11 Write Ram

;RDRAM \$L016012,000000,000000; F1 = 12 Read Ram

;SRMR \$L020013,000000,124000; F1 = 13 Reset Mode Register (emulator only)

;SRB \$L020013,000000,124000; F1 = 13 Set Register Bank (non-emulator)

;ESRB \$L020015,000000,124000; F1 = 15 Set Register Bank (emulator only)

## ;Emulator specific functions decoded by the ETHERNET board

;RSNF \$L000000,070016,000100; F1 = 16 Read Serial (Host) Number

;STARTF \$L016017,000000,000000; F1 = 17 Start I/O

\$M \$R40; The M Register

\$L \$L040001,036001,144200; The L Register

\$T \$L052001,054001,124040; ALUF = 1, The T Register

## ;ALU Functions. \* =&gt; loads T from ALU output

\$ORT \$L000000,050002,000002; ALUF = 2 \*

;ANDT \$L000000,050003,000002; ALUF = 3

;XORT \$L000000,050004,000002; ALUF = 4

;\$+1 \$L000000,050005,000002; ALUF = 5 \*

;\$-1 \$L000000,050006,000002; ALUF = 6 \*

;\$+T \$L000000,050007,000002; ALUF = 7

;\$-T \$L000000,050010,000002; ALUF = 10

;\$-T-1 \$L000000,050011,000002; ALUF = 11

;\$+INCT \$L000000,050012,000002; ALUF = 12 \* synonym for +T+1

;\$+T+1 \$L000000,050012,000002; ALUF = 12 \*

;\$+SKIP \$L000000,050013,000002; ALUF = 13

;\$T \$L000000,050014,000002; ALUF = 14 \*

;\$AND NOT T \$L000000,050015,000002; ALUF = 15

; A request has been made for the following, but it is unlikely ever to be implemented.

;\$ZEROALU \$L000000,050016,000040; ALUF = 16

;ALUF 17 is unassigned

; Handy fakes

\$SINK            \$L044000,000000,124000; DF3 = 0   Bus source without dest  
\$NOP            \$L042000,000000,000000; NDF3 = 0   every computer needs one

; Definitions for the Nova debugger and DEBAL

\$HALT           \$L042001,000000,000000;  
\$BREAK          \$L042003,000000,000000;  
\$WENB           \$L042005,000000,000000;  
\$READY?        \$L042006,000000,000000;  
\$NOVA           \$L044002,046003,124100;  
\$END            \$L034000,000000,000000;

## ;Constant definitions

```

$0          $L000000,012000,000100; Constant 0 is SUPER SPECIAL

$ALLONES4   $M4:177777;      Constant normally ANDed with KSTAT
$ALLONES5   $M5:177777;      Constant normally ANDed with MD
$M17        $M6:000017;      Constant normally ANDed with MOUSE
$ALLONES7   $M7:177777;      Constant normally ANDed with DISP
$M177770    $M7:177770;      Mask for DISP
$M7          $M7:000007;      Mask for DISP
$X17        $M7:000017;      Mask for DISP

$ONE        $1;              The constant 1
$2          $2;
$-2         $177776;         - Disk header word count
$3          $3;
$4          $4;
$5          $5;
$6          $6;
$7          $7;
$10         $10;
$-10        $177770;         - Disk label word count
$17         $17;
$20         $20;
$37         $37;
$ALLONES    $177777;         The REAL -1 (not a mask)
$40         $40;
$77         $77;
$100        $100;
$177        $177;
$200        $200;
$377        $377;
$177400     $177400;
$-400       $177400;         - DISK DATA WORD COUNT
$2000       $2000;
$PAGE1      $400;
$DASTART    $420;           MAIN MEMORY DISPLAY HEADER ADDRESS
$KBLKADR    $521;           MAIN MEMORY DISK BLOCK ADDRESS
$MOUSELOC   $424;           MAIN MEMORY MOUSE BLOCK ADDRESS
$CURLOC     $426;           MAIN MEMORY CURSOR BLOCK ADDRESS
$CLOCKLOC   $430;
$CON100     $100;
$CADM       $7772;
$SECTMSK    $170000;        CYLINDER AND DISK MASK
$SECT2CM    $40000;        SECTOR MASK
$-4         $177774;        CAUSES ILLEGAL SECTORS TO CARRY OUT
$177766     $177766;        CURRENTLY UNUSED
$177753     $177753;        CURRENTLY UNUSED
$TOTUWC     $44000;        NO DATA TRANSFER, USE WRITE CLOCK
$TOWTT      $66000;        NO DATA TRANSFER, DISABLE WORD TASK
$STUWC      $4000;         TRANSFER DATA USING WRITING CLOCK
$STRCWFS    $10000;        TRANSFER DATA USING NORMAL CLOCK, WAIT FOR SYNC
$177000     $177000;
$77777      $77777;
$77740      $77740;
$LOW14      $177774;
$77400      $77400;
$-67D       $177675;
$7400       $7400;
$7417       $7417;
$170360     $170360;
$60110      $60110;
$30000      $30000;
$70531      $70531;
$20411      $20411;
$65074      $65074;
$41023      $41023;
$122645     $122645;
$177034     $177034;
$37400      $37400;
$BIAS       $177700;        CURSOR Y BIAS
$WWLOC      $452;           WAKEUP WAITING IN PAGE 1
$PCLOC      $500;           PC VECTOR IN PAGE 1
$100000     $100000;
$177740     $177740;

```

\$COMERR1	\$277;	COMMAND ERROR MASK
\$-7	\$177771;	CURRENTLY UNUSED
\$177760	\$177760;	
\$-3	\$177775;	
\$4560	\$4560;	
\$56440	\$56440;	
\$34104	\$34104;	
\$64024	\$64024;	
\$176000	\$176000;	
\$177040	\$177040;	
\$177042	\$177042;	
\$203	\$203;	
\$360	\$360;	
\$177600	\$177600;	
\$174000	\$174000;	
\$160000	\$160000;	
\$140000	\$140000;	
\$777	\$777;	
\$1777	\$1777;	
\$3777	\$3777;	
\$7777	\$7777;	
\$17777	\$17777;	
\$37777	\$37777;	
\$1000	\$1000;	
\$20000	\$20000;	
\$40000	\$40000;	
\$-15D	\$177761;	
\$TRAPDISP	\$526;	
\$TRAPPC	\$527;	
\$TRAPCON	\$470;	
\$JSRC	\$6000;	JSR@ 0
\$MASKTAB	\$460;	Mask Table Starting address for convert
\$SH3CONST	\$14023;	DESTINATION = 3, SKIP IF NONZERO CARRY,
;		BASE CARRY = 0
\$600	\$600;	Ethernet addresses
\$601	\$601;	
\$602	\$602;	
\$603	\$603;	
\$604	\$604;	
\$605	\$605;	
\$606	\$606;	
\$607	\$607;	
\$610	\$610;	
\$612	\$612;	
\$ITQUAN	\$422;	
\$ITIBIT	\$423;	
\$402	\$402;	where label block is stored on disk boot
\$M177760	\$M7:177760;	MASK FOR DISP. FOR I/O INSTRUCTIONS
\$JSRCX	\$4000;	JSR 0
\$KBLKADR2	\$523;	
\$KBLKADR3	\$524;	
\$MFRRDL	\$177757;	DISK HEADER READ DELAY IS 21 WORDS
\$MFROBL	\$177744;	DISK HEADER PREAMBLE IS 34 WORDS
\$MIRRD	\$177774;	DISK INTERRECORD READ DELAY IS 4 WORDS
\$MIROBL	\$177775;	DISK INTERRECORD PREAMBLE IS 3 WORDS
\$MRPAL	\$177775;	DISK READ POSTAMBLE LENGTH IS 3 WORDS
\$MWPAL	\$177773;	DISK WRITE POSTAMBLE LENGTH IS 5 WORDS
\$BDAD	\$12;	ON BOOT, DISK ADDRESS GOES IN LOC 12
\$REFMSK	\$77740;	MRT Refresh mask
\$X37	\$M7:37;	NOPAR MASK
\$M177740	\$M7:177740;	DITTO
\$EIALOC	\$177701;	LOCATION OF EIA INPUT HARDWARE
\$7000	\$7000;	mapbase
\$176	\$176;	mapmask
\$177576	\$177576;	mapmask3
\$30	\$30;	reprobing
\$15	\$15;	wrt-1
\$1770	\$1770;	ciad
\$101771	\$101771;	cilow
\$175777	\$175777;	for resetting fbn
\$11	\$11;	just to have small integers

```

$13          $13;
$14          $14;
$16          $16;          for 2CODE
$60          $60;          low R to high R bus source
$776         $776;
$177577      $177577;      -129
$100777      $100777;
$177677      $177677;
$177714      $177714;      (-2fvar+14)

$2527        $2527;
$101         $101;
$630         $630;
$631         $631;
$642         $642;

$1gm1        $M7:1;
$1gm3        $M7:3;
$1gm10       $M7:10;
$1gm14       $M7:14;
$1gm20       $M7:20;
$1gm40       $M7:40;
$1gm100      $M7:100;
$1gm200      $M7:200;

$disp.300    $M7:300;
$-616        $177162;
$-650        $177130;
$22          $22;
$24          $24;
$-20         $177760;
$335         $335;          endcode for getframe
$1377        $1377;          smallnzero
$401         $401;
$2001        $2001;
$21          $21;          just to have them
$23          $23;
$25          $25;
$26          $26;
$27          $27;
$31          $31;
$1675        $1675;
$736         $736;
$-660        $177120;
$300         $300;
$disp.377    $M7:377;
$6001        $6001;          f.e. flg, quick flg, use count
$disp.3       $M7:3;

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; Constants for subroutine returns using IR.
; See 9.2.1 of the hardware manual for details.

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```

$sr1         $60110;
$sr0         $70531;
$sr2         $61000;
$sr3         $61400;
$sr4         $62000;
$sr5         $62400;
$sr6         $67000;          value of 16b mapped to 6 by disp prom
$sr7         $63400;
$sr10        $64024;
$sr11        $64400;
$sr12        $65074;
; Are you wondering why sr13 is missing? So is everyone else.
$sr14        $66000;
$sr15        $66400;
$sr16        $63000;          value of 6 mapped to 16b by disp prom
$sr17        $77400;
$sr20        $65400;
$sr21        $65401;
$sr22        $65402;
$sr23        $65403;
$sr24        $65404;
$sr25        $65405;
$sr26        $65406;
$sr27        $65407;

```

\$sr30	\$65410;	
\$sr31	\$65411;	
\$sr32	\$65412;	
\$sr33	\$65413;	
\$sr34	\$65414;	
\$sr35	\$65415;	
\$sr36	\$65416;	
\$sr37	\$65417;	
\$-13D	\$177763;	
\$ERRADDR	\$177024;	AltoII MEAR (Memory Error Address Reg)
\$ERRSTAT	\$177025;	AltoII MESR (Memory Error Status Reg)
\$ERRCTRL	\$177026;	AltoII MECR (Memory Error Control Reg)
\$REFZERO	\$7774;	
\$2377	\$2377;	Added for changed Ethernet microcode
\$2777	\$2777;	
\$3377	\$3377;	
\$477	\$477;	Added for BitBlt
\$576	\$576;	Added for Ethernet boot
\$177175	\$177175;	

;Requests for the following new constants have been made:  
;NOTE THAT THESE ARE NOT YET DEFINED

;\$lgm2	\$M7:2;
;\$lgm4	\$M7:4;
;\$32	\$32;
;\$33	\$33;
;\$34	\$34;
;\$35	\$35;
;\$36	\$36;